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**Judith Niehues**

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A Dynamic Panel Approach**

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# Social Spending Generosity and Income Inequality: A Dynamic Panel Approach

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## Abstract

This paper explores whether more generous social spending policies in fact lead to less income inequality, or if redistributive outcomes are offset by behavioral disincentive effects. To account for the inherent endogeneity of social policies with regard to inequality levels, I apply the System GMM estimator and use the presumably random incidence of certain diseases as instruments for social spending levels. The regression results suggest that more social spending effectively reduces inequality levels. The result is robust with respect to the instrument count and different data restrictions. Looking at the structure of benefits, particularly unemployment benefits and public pensions are responsible for the inequality reducing impact. More targeted benefits, however, do not significantly reduce income inequality. Rather, their positive effect on pre-government income inequality hints at substantial disincentive effects.

**Keywords:** Social Benefits, Redistribution, Income Inequality, System GMM

**JEL Codes:** D31, D60, H20

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## I. Introduction

The relationship between redistributive policies and income inequality has generated much debate among social scientists and policy makers. In particular, the equity efficiency trade-off is fundamental in the public finance literature, and state interventions are often considered to decrease efficiency. Market forces alone, however, do not necessarily bring about a desirable distribution of income in terms of equity. This is seen as a justification for government intervention, and it is widely accepted that public policies can play a key role in redistributing income. However, while there is supposedly no doubt that all nations would *ceteris paribus* prefer less income inequality among their citizens, they differ dramatically in the extent to which they reach this goal. Therefore, understanding the differences in the design of fiscal and social policies and their corresponding distributive outcomes is crucial not only to public economics, but also to other social sciences.

Using a dynamic panel approach with European countries and a time period from 1993 until 2007, this paper investigates whether a more generous welfare state is indeed *causally* related to more equality in the distribution of incomes. Besides the overall effect of social spending, this study also asks which kind of benefits are most effective in reducing income inequality by examining the specific structure and characteristics of benefits. In particular, the theoretical framework of the analysis elaborates on how far inequality reducing first-round effects might be offset by negative behavioral responses induced by redistributive social policies. As a consequence, the total effect on income inequality is ambiguous. While the most extensive part of the empirical analysis looks at the determinants of post-government income inequality (i.e., the overall effect), behavioral second-order effects are identified by using next-period pre-government income inequality as a dependent variable.

Generally, my approach can be regarded as part of the large body of literature that tries to

identify the determinants of income inequality in cross-national comparison (see Atkinson and Brandolini 2005 for a survey). One of the most tested theories of income inequality is the well-known Kuznets hypothesis (Kuznets 1955), which predicts an inverted-U relationship between inequality and the level of economic development (see, among others, Galor and Tsiddon 1996; Barro 2000; Li, Xie, and Zou 2000). Further studies focus on other macroeconomic factors such as globalization (Edwards 1997; Alderson and Nielsen 2002; Dreher and Gaston 2008), inflation (Bulir and Gulde 1995; Galli and van der Hoeven 2001) or financial development (Clarke et al. 2006) to explain variations in income inequality across countries.

The effect of *institutional* factors on income inequality has been analyzed less. This is certainly due to the inherent endogeneity of policies with respect to inequality levels. Because social policies might be thought of as mechanisms for reducing income inequality, they might also be determined by inequality levels. This raises the problem of *reverse causality*. Recently, some studies have become available that focus on the impact of labor market institutions on income inequality, using instrumental variable approaches to handle endogeneity issues. For example, Checchi and García-Peñalosa (2008, 2010) develop a formal model of how labor share, union density, and unemployment benefits influence income inequality. Using three-stage least squares, they find that labor market institutions indeed reduce income inequality, but that this effect is associated with higher unemployment rates. Calderon and Chong (2009) apply the System GMM-IV approach and find that both *de jure* and *de facto* labor market regulations tend to improve the equality of incomes. They also evaluate the effect of separate regulations and reveal distinct effects. In the context of fiscal policies, Duncan and Peter (2008) analyze the effect of the structural progressivity of income taxes on inequality in observed and true incomes. They use a two-stage least squares approach with weighted averages of tax/progressivity measures in neighboring countries as instruments for their fiscal policy variable.

Although most studies of inequality determinants also control for the impact of social spending, to the best of my knowledge, the effect of social policies as a key explanatory variable of income inequality has not yet been analyzed. Also, none of these studies has accounted for the endogeneity of social policies with respect to income inequality. Thus, in line with Dreher and Gaston (2008) and Calderon and Chong (2009), I apply the System GMM estimator, which is capable of dealing with the issue of reverse causality in a dynamic panel design, to evaluate the impact of social policies on income inequality. Instead of relying only on internal instruments, however, I also use the presumably random incidence of certain diseases to instrument for the possible endogeneity of redistributive policies.

The regression results suggest that a larger redistributive budget is strongly related to lower income inequality levels. The effect also remains robust when using differing numbers of instruments and data restrictions, supporting a *causal effect* of social spending levels on income inequality. Looking at the structure of benefits, the age-related and unemployment benefits in particular are responsible for the inequality reducing impact. More targeted benefits, however, do not significantly reduce income inequality. Rather, the positive effect on pre-government income inequality hints at the importance of possible disincentive effects associated with means-testing.

The paper is organized thus: In Section 2, I introduce the theoretical considerations underlying the analysis. Section 3 describes the data and methodology. Section 4 presents the regression results, and Section 5 summarizes the main findings.

## **II. Theoretical Framework**

Some mechanisms correlate the welfare state to income inequality, wherein the term “welfare state” is used as shorthand for the total of social benefits provided by the state. The objective, however, is not to provide a complete theoretical picture of all possible effects of policies that influence inequality, but rather to highlight some major mechanisms to develop

testable hypotheses. The focus of this study is certainly the empirical exploration of the impact of social spending on income inequality.

At first glance, the impact of the welfare state on income inequality seems trivial, since as long as social benefits are somehow redistributive, the first-round effect on the inequality of post-government incomes is by definition negative. This effective redistributive effect is usually measured in micro studies by comparing pre-government income inequality with the inequality in post-transfer incomes. Indeed, Immervoll and et al. (2005), Whiteford (2008), and Fuest et al. (2010) find substantial redistributive effects of social benefits. Consequently, one might expect a negative effect of social benefits on income inequality. However, this standard approach of measuring redistribution is problematic because it neglects the fact that the pre-government distribution of income is not independent of welfare state policies. Social benefits are generally associated with behavioral second-order effects that then influence the distribution of market incomes before government intervention. In fact, the provision of income transfers might influence behavior in manifold ways, with each having differing impacts on income inequality.<sup>1</sup> I will focus on the labor-supply–related responses induced by social policies and their possible impact on the distribution of incomes.

Generally, all forms of social protection create some disincentives to work. As standard consumer theory suggests, any additional transfer payments shift the recipients' budget constraints, which means that recipients have to work less to obtain a given standard of living. Assuming that leisure is a normal good, the positive income effect reduces the labor supply. If the design of the benefit involves a benefit reduction as income increases, this will impose an implicit marginal tax rate on additional earnings that also unambiguously decreases the labor

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<sup>1</sup>Income transfers may have an impact on private savings and investments, on demographic choices, the unemployment rate, consumption decisions, and the formation of human capital (see Danziger et al. 1981 for further references). In addition, the financing sources of benefits such as taxes and contributions are also associated with their own behavioral responses, which are not discussed here.

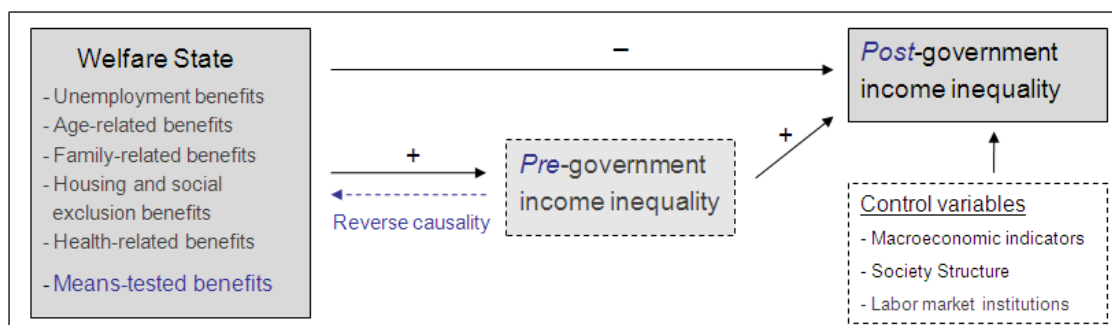
supply. Supposing that low income earners reduce their labor supply more than high income earners, social benefits will lead to an increase of pre-government income inequality. In the empirical labor supply literature, it is a robust finding that average labor supply elasticities (taking into account participation elasticities as well as hours of labor supply) strongly decline with income (as pointed out in Roed and Strom 2002 and also recently found in Aaberge and Colombino 2006). If benefit levels discourage recipients from taking part in the labor market at all, this leads to an increase in the unemployment rate, which in turn also increases pre-government income inequality. Given these considerations, I expect a positive effect of social benefits on pre-government income inequality.<sup>2</sup> Thus, taking into account second-order disincentive effects, the redistributive effects of social benefits might be smaller than the micro-studies would suggest. In fact, at the macro level, the distributional effect of social benefits on post-government income is a priori not clear. The hypothesized effects of the welfare state on pre- and post-government income inequality are also illustrated in Figure 1.

The “welfare state,” however, is a complex construct that consists of several different social programs, each with different objectives and thus different effects on the distribution of pre- and post-government incomes. Most generally, social benefit programs can be divided into two groups: social insurance versus social assistance benefits (Danziger et al. 1981; Barr 2004). Whereas social assistance benefits are generally provided on the basis of an income test to help people with low incomes, the main objective of social insurance benefits is to maintain income in the face of adverse risks (such as unemployment, disability, and sickness) or to redistribute income across the life-cycle (age-related benefits, family-related benefits).

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<sup>2</sup>The “redistributive paradoxon” introduced by Sinn (1995) strengthens the expectation of a positive effect of the welfare state on pre-government income inequality. The underlying argument is that the social security system induces increasing investment in risky assets and moral hazard effects. Therefore, paradoxically, more redistribution may result in more post-tax inequality.





**Figure 1 Social Spending Policies and Income Inequality**

These different objectives of the benefit functions imply different expectations about their distributional outcomes.<sup>3</sup> For example, insurance-related benefits such as unemployment, sickness, and disability benefits need not necessarily be organized to redistribute from the rich to the poor. In the case of insurance-related benefits, one does not have to claim financial need, but eligibility and benefit level depend on past contributions and the event of unemployment, illness, or invalidity. If the benefits are completely actuarial and designed exclusively to maintain status and income, they should have no equalizing effect. However, in most developed countries, the social insurance benefits of low income earners are disproportionately higher than their past contributions. Redistribution also occurs if benefit claims are more common in the low income part of the population, which is often the case. The argumentation in the context of public pensions is similar: Although redistribution is not an inherent part of pensions, most systems apply some redistributive formula that favors the poor. With respect to family-related programs, they usually imply redistribution (from rich to poor and across the life-cycle), since most families with children are typically among the younger segments of the populations that are characterized by low incomes. Housing benefits, on the other hand, are directly designed to help recipients meet the cost of housing, and eligibility is usually based on a kind of financial need test. Similar to the case of pure social assistance benefits (such as an minimum income guarantee), the main

<sup>3</sup>The following explanations about expected distributional outcomes of different social benefits mainly draw upon Barr (1992) and Barr (2004).

motive is vertical equity. Consequently, their expected first-round effect on income inequality is particularly high. Housing benefits and minimum income guarantees generally belong to the category of social assistance benefits.

With respect to the incentive effects of these different benefit functions, it is certainly possible to identify some expectations about typical behavioral effects. For example, it is generally assumed that extremely high unemployment benefits (replacement rates) provide little financial incentive to work, causing “unemployment traps” (Barr 2004,179; Meyer 2002), which in turn increase pre-government income inequality. In the context of public pensions and labor-supply-related responses, it is discussed if they induce early retirement (Gruber and Wise 1998; Blundell et al. 2002).<sup>4</sup> Family-related benefits are often expected to reduce the labor supply of second-income earners. In the case of unemployment benefits, however, empirical evidence suggests that the labor supply depends more on other characteristics such as the maximum duration of benefits than on the pure level of benefits (Atkinson and Micklewright 1991). Furthermore, many programs involve some further eligibility conditions (e.g., working-tax credits, in-work benefits) that may partly offset behavioral disincentive effects (Blundell 2000). Thus, to develop testable hypotheses of the behavioral effects of different benefit functions, further information on the specific design and financing of the program is needed. Thus, the overall effect of different benefit functions on post-government income inequality remains an empirical matter.

From a theoretical viewpoint, the effect of means-tested benefits on pre-government income inequality is less controversial. Means-tested benefits generally involve a reduction in the level of benefits as earnings increase. This leads to implicit marginal tax rates above 100 percent and major labor-supply disincentives (Danziger et al. 1981; Pestiau 2006). Since means-tested

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<sup>4</sup>Another debate relates to the question of whether public pensions reduce private savings (see for example Feldstein 1974), with negative effects on economic growth and adverse effects on aggregate income inequality.

benefits are expected to reduce the labor supply more for low income earners than for high income earners, pre-government income inequality is expected to increase (Bergh 2005). Therefore, the equalizing first-round effects of more targeting are likely to be counteracted by negative behavioral effects on pre-government income inequality.<sup>5</sup> As Atkinson (1995) states, “the case for greater targeting is typically based on the assumption of a fixed total budget for the social security ministry....Account has to be taken of changes in the behaviour of recipients, and the limits to targeting may arise from the adverse incentives created’ (224). Accordingly, I expect a clear positive effect of the proportion of means-tested benefits on pre-government income inequality. The overall effect on post-government income inequality, though, is a priori not clear.

Figure 1 also illustrates the endogeneity problem of social programs with respect to inequality in the pre-government distribution of incomes. Following the famous median voter theorem, higher inequality levels may also lead to higher redistribution (Meltzer and Richard 1981). I will deal with this issue of reverse causality in the empirical part of the paper. Figure 1 also hints at further control variables that are expected to influence income inequality. The choice of indicators is based on previous analyses of the income inequality determinants already described. Basically, I will use three sorts of indicators: macroeconomic factors, socio-economic society characteristics, and indicators for the influence of labor market institutions.

### **III. Data and Methods**

The dependent variable of the main part of the empirical analysis is the Gini Coefficient of equivalized disposable income.<sup>6</sup> Disposable income means factor income originally earned at the market minus taxes plus social transfers; it therefore represents the income that finally matters

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<sup>5</sup>Korpi and Palme’s (1998) considerations of less political support and smaller redistributive budgets in the case of greater low-income targeting also provide arguments for the counteracting effects of redistributive effects of means-testing.

<sup>6</sup>In the case of maximum inequality, the standardized Gini coefficient equals one, and it corresponds to zero when all incomes are equal. Concerning the sensitivity on the distribution scale, the Gini coefficient attaches most weight to transfers among mid-level incomes.

for the individual. The unit of analysis is the individual. To compensate for different household structures and possible economies of scales within households, I use equivalized household incomes for computing Gini coefficients. For each person, the equivalized (per-capita) total net income is its household total net income divided by the equivalized household size, according to the modified OECD scale.<sup>7</sup> The data for the Gini coefficient is based on three different micro-data sources. Data for the income reference period 1993 until 2000 is based on the ECHP (European Community Household Panel), a household survey with a common conceptual framework conducted in the member states of the EU, co-ordinated by the Statistical Office of the European Communities (Eurostat). The survey covers the old EU-15 member states, although data for Austria (1993), Finland (1993, 1994), and Sweden (1993-1995) is missing for the first periods. Gini coefficients for the year 2001 are based on the statistics of the baseline tax benefit systems of EUROMOD, a micro-simulation model for European countries.<sup>8</sup> Gini Coefficients from 2003 until 2006 are based on EU-SILC (Statistics on Income and Living Conditions) micro-data, which is the successor of ECHP data. The EU-SILC provides harmonized cross-sectional and longitudinal multidimensional micro-data on income and social exclusion in European countries. After its start in 2003 with seven European countries, in the 2004 wave, it covered all old EU-15 member states except Germany, the Netherlands, and the UK (Gini coefficients for these countries are also taken from the EUROMOD statistics). Since wave 2005, the dataset covers the 25 EU member states (except Malta), plus Norway and Iceland.

Overall, I have 223 observations for the Gini coefficient of post-government income, until 2003 covering the EU-15 countries and from 2004 onward also including the new European

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<sup>7</sup>The modified OECD scale assigns a weight of 1.0 to the head of household, 0.5 to every household member aged 14 or more, and 0.3 to each child aged less than 14. Summing up the individual weights gives the household-specific equivalence factor.

<sup>8</sup>EUROMOD statistics on Distribution and Decomposition of Disposable Income, accessed at <http://www.iser.essex.ac.uk/research/euromod/statistics/> using EUROMOD version no. D21 (June 2008). For further information on EUROMOD, see e.g., Sutherland 2001, Lietz and Mantovani 2006, and Sutherland 2007.

member states (except Malta, Slovenia, Romania, and Bulgaria) plus Norway, which is also included in the sample. Unfortunately, there are no comparable data sources for the EU-15 for 2002. Also, there is an unavoidable disruption in the time series of indicators produced when using different data surveys that has to be kept in mind when one interprets the results.<sup>9</sup> However, this is the best annual data available for EU member states. In fact, the cross-national comparability of the micro-data and the time period covered are major contributions of this study.<sup>10</sup> In particular, the usage of micro-data ensures that all Gini coefficients are based on the same income concept.

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-government Gini Coefficient	223	29.02	4.43	20.48	39.24
Pre-government Gini Coefficient	80	48.40	3.43	38.80	55.30
Social benefits/GDP	223	23.90	5.03	11.90	32.60
Means-tested/Soc Ben	223	9.08	6.55	0.82	33.12
Unemployment/Soc Ben	223	7.11	4.07	0.90	21.68
Family-related/Soc Ben	223	9.19	3.49	1.89	17.58
Invalidity/Soc Ben	223	9.39	3.31	3.75	19.06
Health and sickness/Soc Ben	223	27.72	4.61	17.53	42.66
Old-age and survivor/Soc Ben	223	43.26	7.92	24.68	64.09
Housing and exclusion/Soc Ben	223	3.33	2.06	0.11	7.78
GDP per capita (in 1000\$)	223	31.36	14.30	6.19	78.89
Dependency ratio	223	49.14	3.33	39.36	59.05
Proportion higher education	223	63.28	18.47	17.80	90.30
Union density	223	37.87	21.26	8.00	85.10

**Table 1 Descriptive Statistics**

In the second part of the analysis, I also use the Gini coefficient of original incomes as a dependent variable, meaning incomes before any redistributive government intervention. Unfortunately, data on pre-government incomes is only available from 2003 onward and then only for a limited country sample. Altogether, this totals at most 80 observations for the Gini

<sup>9</sup>In various robustness checks, however, I check how far this structural break influences the results. Also, I restrict the sample to EU-15 countries and EU-SILC data only. The results are illustrated in the Appendix.

<sup>10</sup>See Atkinson and Brandolini (2001, 772), who comment on the pitfalls in the use of secondary inequality data: “Gini coefficients of income inequality may be published for a range of countries, but there is no agreed basis of definition. [...] We cannot therefore be sure whether results of comparative or econometric analyses obtained using such data are genuine or a product of data differences.”

coefficient of pre-government incomes. Still, comparability concerns decrease because the computation of the pre-government Gini coefficients is based on a single data source, which is EU-SILC micro-data. Throughout the analysis, Gini coefficients are measured on a scale from 0 to 100. Descriptive statistics for the Gini coefficient of pre-government and post-government incomes are illustrated in Table 1.

Following this theoretical framework, the key explanatory variables of the analysis are indicators for the social spending structure of the welfare state. All data for these variables is taken from the Eurostat database. Thus, I use *total social benefits* to operationalize the overall spending generosity of the welfare state. Social benefits encompass all expenditures incurred by social protection systems apart from any operating expenditures. However, there are critical views of using such data.<sup>11</sup> In fact, it would be more accurate to use, for example, net social expenditures, which also take into account the impact of taxation and private benefits on social expenditures (see Adema and Ladaique 2009). Unfortunately, this data is not available for the countries and time period I investigate. Throughout the analysis, total social benefits are expressed as proportion of GDP to account for different country sizes. To analyze the impact of different social spending categories on income inequality, I rely on the different benefit functions of the core system of the Social Protection Statistics provided by Eurostat. Thus, I look at *unemployment, family, health, and invalidity-related benefits* separately. I add *survivors' benefits* to the category of *old-age-related benefits* and combine *housing and social exclusion benefits*, whereas social exclusion benefits only represent a small residual function in the Eurostat Social Protection Statistics.<sup>12</sup> To measure the degree of low income targeting of welfare states, I apply

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<sup>11</sup>See for example de Deken and Kittel (2007), who critically assess using data on social expenditures as they are available in Eurostat. For further information on methodological issues regarding variables of the spending dimension of social protection schemes, see European Commission (1996).

<sup>12</sup>See European Commission (1996) for further information on the definition of different spending categories in the Social Protection Statistics as published by Eurostat.

the proportion of *means-tested* social benefits as a percentage of total social benefits. Means-tested benefits are social benefits that are explicitly or implicitly triggered by the beneficiary's income falling below a specific level.

Beside social spending, there obviously are also a number of further variables that are expected to influence income inequality. The indicators that I will control for in my empirical analysis is based on previous studies on income inequality determinants, which I briefly surveyed at the beginning of the paper. Thus, I include three sorts of indicators: macroeconomic factors, socio-economic society characteristics, and indicators for the influence of labor market institutions. As macroeconomic indicators, I use *GDP per capita* (measured in constant international 1000 \$) and *GDP per capita squared* to control for the aggregate income levels of countries. The data for the level of economic development is taken from the World Development Indicators (WDI) from the World Bank Group.

Variables that represent the socio-demographic and -economic structure of the society such as the *dependency ratio* (the proportion of population aged under 15 and over 64 as a percentage of total population) and the *proportion of the population aged between 25 and 64 that has at least a higher secondary education* are again from the Eurostat database.

Measures of the influence of labor market institutions are taken from the ICTWSS Database on International Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts in 34 countries between 1960 and 2007. *Union density* presents the net union membership as a proportion of wage and salary earners in employment.<sup>13</sup> Finally, I also include a *dummy for post-socialist* new EU member states since their inequality levels may differ for reasons not captured by the control variables.

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<sup>13</sup>Within robustness checks, I also included GDP growth, the inflation and unemployment rate, population growth, and different openness indicators as additional control variables. I dropped these variables in the final estimations because they either did not have a significant impact on inequality or due to multicollinearity concerns. However, the inclusion of these additional controls did not substantially change the results.

As has been indicated, this study is based on an unbalanced, pooled cross-sectional time series (CSTS) of at most 183 cases in 24 European countries. To empirically estimate the hypotheses derived in Section 2, I will use a reduced form equation such as

$$y_{it} = \alpha y_{it-1} + \beta S_{it} + \gamma X_{it} + \mu_i + \mu_t + \varepsilon_{it} \quad (1)$$

with  $y_{it}$  as the inequality measure of country  $i$  at time point  $t$ , which is either the Gini coefficient of post-government income or the Gini coefficient of pre-government income.  $S_{it}$  represents the variable of interest, the overall generosity of the welfare state, represented by total social benefits per GDP.  $X$  is a vector of control variables as described in the previous section. Finally,  $\mu_i$  presents country-specific effects,  $\mu_t$  period-specific effects, and  $\varepsilon_{it}$  the idiosyncratic error term. The lagged dependent variable is included because income inequality is rather persistent over time. In the presence of country fixed effects, OLS will lead to biased and inconsistent estimates in this dynamic panel setting.<sup>14</sup> Thus, my preferred method of estimation is System GMM, which was introduced by Blundell and Bond (1998). More specifically, I use the System GMM estimator as implemented by Roodman (2009a) in Stata. In contrast to Difference GMM (Arellano and Bond, 1991), in which differences are instrumented with levels, the Blundell-Bond estimator instruments levels with differences. The underlying idea is that in the presence of persistent processes, past changes may be more predictive of current levels than past levels of current changes. Consequently, the instruments become more relevant. System GMM uses both the equation in differences and the equation in levels. Thus, System GMM also allows for including time-invariant variables in the level equation. In some additional specifications, I will also analyze the impact of specific social programs  $S^k$  (such as unemployment benefits, family-related benefits, old-age related benefits, and so on) on income inequality. To avoid omitted

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<sup>14</sup>In fact, OLS will tend to produce an upward bias in the coefficient of the dependent variable; for a fixed effects model, the opposite is true. Thus, a valid specification should produce coefficient estimates for the lagged dependent variable that lie within or near this range of estimates.



variable biases, I also include a measure of total social benefits less the specific benefits  $k$  in question ( $S^{1-k}$ ) to simultaneously control for other social benefits:<sup>15</sup>

$$y_{it} = \alpha y_{it-1} + \beta_1 S_{it}^k + \beta_2 S_{it}^{1-k} + \gamma X_{it} + \mu_i + \mu_t + \varepsilon_{it} \quad (2)$$

The Difference and System GMM regression approaches are particularly useful because they can deal with endogenous regressors and reverse causality. Since I look at the impact of social policies on income inequality, there is no appropriate counterfactual without the social policy in place. In fact, in my particular setting, the long-established median voter theorem suggests that higher inequality could also lead to more redistribution (Meltzer and Richard 1981). Accordingly, inequality levels might also influence the design of redistributive policies. This possible reverse causality implies that the results for the generosity of the welfare state are likely to be biased upward. Generally, System GMM is intended to build internal instruments for the predetermined dependent and additional endogenous regressor variables.

To deal specifically with the endogeneity of my social policy variable, I also include external instruments in my estimations. In the macro-context of developed countries in particular, appropriate instruments, and therefore an exogenous variation in social spending, are difficult to find. This paper uses the presumably random incidence of certain diseases to instrument for the possible endogeneity of redistributive policies. Unfortunately, comparable data on the incidence of such diseases is rare. Finally, I include the number of hospital discharges of multiple sclerosis patients per 100,000 and the standardized death rates for malignant melanoma of skin and malignant neoplasms of the prostate as proxies for the incidence of these diseases.<sup>16</sup> I assume that they are not systematically related to behavioral effects, income, or income inequality, but that

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<sup>15</sup>See Caldero and Chong (2009) for a similar approach to analyzing the impact of specific labor market regulations on income inequality.

<sup>16</sup>Additionally, I used the incidence of female breast cancer and the number of hospital discharges of musculoskeletal system and connective tissue disease patients from the European Health for All Database (HFA-DB). However, data is only available for a very restricted sample of countries. The corresponding results are qualitatively the same and can be obtained from me upon request.

the incidence of these diseases is not clear and mainly arises from unsystematic genetic predisposition. On the other hand, an increasing incidence of such diseases is obviously associated with an increase in health-care expenditures and can therefore be regarded as an exogenous variation in social spending. Of course, the pure incidence of such diseases would be more appropriate because the indicators actually used might again be related with the social health-care system of a particular country. However, such data is not available for a sufficient number of countries. Beside the social spending variables and the lagged dependent variables, I treat all other regressors as strictly exogenous, meaning they instrument themselves. System GMM involves many specification choices. Since my case involves a rather unbalanced panel, I use forward orthogonal deviations (Arellano and Bover 1995) instead of differences to maximize the sample size. Also, I apply the one-step estimator with small sample correction and robust standard errors to account for heteroskedastic error structures. Recently Roodman (2009b) discusses the problem of having too many instruments that might overfit endogenous variables. In fact, System GMM uses all available instruments, and the number of instruments increases quartic to the number of time points. In my specific setting of  $N$  being only slightly larger than  $T$ , this might especially be an issue. Thus, I test the robustness of the results to severely reducing the instrument count by collapsing instruments and restricting the number of lags used as instruments. In addition, I look at the Difference-in-Hansen test for the instruments of the level equation as recommended by Roodman (2009b). Obviously, another concern in my setting is the structural break in the time series of the underlying micro-data for the Gini coefficient. Thus, I conduct several robustness checks by testing for the existence of structural breaks in the full sample and restrict the sample to using EU-SILC data only.

## IV. Results

Table 2 presents the results of the impact of total welfare spending on post-government income inequality, measured by the Gini coefficient of disposable income. The specification in column (1) uses all available instruments as suggested by the System GMM estimator. As the results reveal, the lagged dependent variable is significantly different from zero at a one percent significance level, emphasizing the persistence of inequality levels over time. Also, the findings in column (1) reveal a negative effect of the overall generosity of the welfare state in terms of social benefits per GDP. The effect is significant at a five percent significance level. With respect to the macroeconomic control variables, the results support a U-shaped relationship between GDP per capita and income inequality. Accordingly, in line with comparable studies on developed countries (e.g., Dreher and Gaston, 2008), the findings do not support the Kuznet hypothesis of an inverted U-shaped relationship between inequality and the level of economic development. The dependency rate and the proportion of higher education do not show significant effects on income inequality in this specification. Post-socialist EU member states reveal income inequality levels that are on average 3 Gini points lower than do countries without a socialist history. According to this specification, union density does not seem to have a significant effect on income inequality. As the identification statistics at the bottom of Table 2 suggest, the specification passes the Sargan overidentification test and the Arellano-Bond test of second-order serial correlation in error terms. However, the perfect Hansen statistic of 1.000 indicates that instrument proliferation might be an issue in this specification with all available instruments.

Thus, in the next estimations, I significantly reduce the instrument count by first collapsing the instruments and then using only the collapsed second-lag instruments, as suggested in Roodman (2009a) and Roodman (2009b). Even when severely reducing the number of

instruments, the effect of social spending on income inequality remains significant, suggesting that redistributive first-round effects outweigh any negative second-order effects. With respect to the other covariates, the lagged dependent variable loses its significance in these specifications, whereas the intuitive positive effect of the dependency rate now turns significant. It should be noted that specification (3) also passes the Difference-in-Hansen test for both the full instrument set for the level equation as well as those based on the lagged dependent variable, supporting the finding of a *causal effect* from social spending on income inequality.

Dependent Variable: Gini Coefficient Post-Government Income

VARIABLES	(1) Full instrument count	(2) Collapsed instruments	(3) Collapsed second-lag
Lagged Gini Coefficient	0.650*** (0.088)	0.205 (0.165)	0.338 (0.219)
Social Benefits/GDP	-0.157** (0.062)	-0.275** (0.102)	-0.329** (0.124)
GDP pc (in 1000 int \$)	-0.150** (0.058)	-0.324*** (0.089)	-0.290*** (0.083)
GDP pc squared (in 1000 int \$)	0.001* (0.001)	0.003*** (0.001)	0.002*** (0.001)
Dependency Rate	0.108 (0.076)	0.239* (0.119)	0.224* (0.118)
Prop Secondary Education	-0.013 (0.014)	-0.048 (0.030)	-0.020 (0.035)
Post-communist	-3.297** (1.213)	-5.052** (1.901)	-5.858*** (1.977)
Union density	-0.009 (0.013)	-0.038* (0.019)	-0.029 (0.019)
Period Effects	✓	✓	✓
Observations	183	183	183
Number of countries	24	24	24
Number of instruments	145	49	23
Sargan test	0.186	0.435	0.210
Hansen test	1.000	1.000	0.510
A-B test 2nd-order corr	0.327	0.407	0.358

System GMM estimations with robust standard errors, small sample correction, and forward orthogonal deviations. All equations also include external instruments.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 2 Social Spending Generosity and Post-Government Income Inequality**

As indicated, another concern might be the structural break in the time series of the underlying micro-data for the Gini coefficient. Therefore, Table 5 in the Appendix also reports the results of some data robustness checks. In the first specification, I restrict the sample to EU-15 member states to check the sensitivity of the results with respect to the inclusion of new EU member states. The result of social spending remains negative and significant. Yet, the p-value of the Sargan test does not pass the 10% level, indicating that the instruments may not be valid in this specification. The second specification in Table 5 only uses EU-SILC micro-data. Thus, all observations before 2003 are dropped, and the number of observations decreases to 75. Again, the inequality-reducing effect of social spending is significant. Specification (3) indicates that, indeed, inequality levels after the data break in 2002 are on average one Gini point higher. Still, as the interaction effect in the last column shows, this does not significantly influence the effect of social spending on income inequality.<sup>17</sup>

The robustness of the results with respect to the instrument count and different data restrictions strongly supports a negative relationship between social spending and income inequality. Therefore, even if social benefits might be associated with negative disincentive effects that are positively correlated with pre-government income inequality, the overall effect on post-government income inequality is negative. Table 3 reports the effects of different social benefits on post-government income inequality. The estimations basically follow equation (2) and estimate the isolated effects of specific benefits, while simultaneously controlling for the other social benefits. The specification of each row is similar to that in Table 2 column (4), including the additional control variables and period effects. All models pass the Sargan and second-order serial correlation tests. As the results show, only the unemployment-related benefits and the old-age and survivor benefits reveal statistically significant effects on income inequality.

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<sup>17</sup>Table 6 in the Appendix also illustrates the effects of social spending on income inequality when using the OLS and FE estimator. The effects are similar and remain significant.

Both effects are negative, indicating implicit redistribution formulas in both unemployment and pension benefits. The effect of family-related benefits is negative, but not statistically significant. On the other hand, the disability benefits and health-related benefits display positive signs, which might give some support to the idea that they have other objectives rather than redistribution. Nevertheless, both effects are statistically insignificant. Although the first-round effect of housing and social exclusion benefits is expected to be clearly inequality reducing, the overall effect on post-government income inequality is not significant and positive. Thus, there is some evidence that negative behavioral effects induced by these social assistance benefits outweigh their inequality decreasing first-round effects. Overall, the results of Table 3 show that different social benefit functions display distinct effects on post-government income inequality. These findings indicate that the category of social assistance benefits is not responsible for the negative effect of social spending on income inequality, but insurance-related benefits such as unemployment and pension benefits are.<sup>18</sup>

Dependent Variable: Gini Coefficient Post-Government Income						
VARIABLES	Coefficient		Std.Dev.	Obs.	Sargan	AB AR(2)
Social Benefits	-0.275	**	0.102	183	0.435	0.407
Unemployment	-0.198	*	0.098	183	0.721	0.385
Family-related	-0.139		0.169	183	0.596	0.409
Invalidity	0.053		0.145	183	0.778	0.465
Health-related	0.032		0.143	183	0.470	0.418
Old-age and survivor	-0.119	**	0.047	183	0.809	0.469
Housing and exclusion	0.057		0.188	183	0.741	0.428
Full specification of each row includes the same control variables as the estimations in Table (1) column (4). System GMM estimations with robust standard errors, small sample correction, forward orthogonal deviations, and collapsed instruments. All equations also include external instruments.						
*** p<0.01, ** p<0.05, * p<0.1						

**Table 3 Income Inequality and Different Benefit Functions**

<sup>18</sup>Using OLS and FE as estimation methods, unemployment benefits and family-related benefits reveal a significant inequality reducing impact. Public pensions, though, lose significance in the FE model (see Table 6 in the Appendix).

Within the theoretical framework, I also derived expectations about the effects of social spending and the benefit targeting structure on pre-government income inequality. Therefore, in Table 4, I contrast the results of social spending and the proportion of means-tested benefits on post-government inequality with the corresponding effects on pre-government income inequality. Column (1) is identical to column (4) in Table 2. In the second specification, I include the proportion of means-tested benefits along with the proportion of non-means-tested benefits, to control for the rest of social benefits. Since in specifications (3) and (4) I specifically try to identify second-order behavioral effects that go along with social policies, I include lagged measures of social spending and means-tested benefits.<sup>19</sup> It should be noted that the number of observations is rather small in these specifications, with pre-government income inequality as a dependent variable, since data is only available for a restricted sample. In fact, estimations are only based on 56 observations in 20 countries.

The results in column (2) suggest that the proportion of means-tested benefits does not have a significant effect on post-government income inequality, although they are specifically targeted at low income groups. This finding is line with the previous finding of housing and social exclusion benefits, which make up a large part of means-tested benefits. When looking at the effects on pre-government inequality, the lagged value of social benefits reveals a positive correlation, though the effect is not significant at conventional significance levels. With respect to the lagged value of the proportion of means-tested benefits, I find a comparatively large positive effect on pre-government inequality, which is significant at a 5% level. This strongly corroborates with my hypotheissis that a more targeted spending structure is associated with

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<sup>19</sup>I should emphasize that the results remain qualitatively the same when including current instead of lagged values for the social spending variables.

higher pre-government income inequality.<sup>20</sup>

Dependent Variable: Gini Coefficient Post- and Pre-Government Income				
VARIABLES	(1) <i>Post-Government Inequality</i>	(2)	(3) <i>Pre-Government Inequality</i>	(4)
Lagged Gini	0.205 (0.165)	0.401** (0.159)	0.579*** (0.200)	0.194 (0.155)
(Lagged) Social Benefits	-0.275** (0.102)		0.130 (0.085)	
(Lagged) Means-tested/Soc Ben		-0.047 (0.147)		0.479** (0.175)
(Lagged) Non means-tested		-0.405* (0.201)		0.364** (0.140)
GDP pc (in 1000 int \$)	-0.324*** (0.089)	-0.331** (0.140)	0.317* (0.171)	-0.058 (0.264)
GDP pc squared (in 1000 int \$)	0.003*** (0.001)	0.003* (0.001)	-0.003* (0.002)	0.001 (0.003)
Dependency Rate	0.239* (0.119)	-0.026 (0.184)	0.080 (0.160)	0.596*** (0.180)
Prop Secondary Education	-0.048 (0.030)	-0.001 (0.030)	-0.038 (0.044)	-0.056 (0.038)
Post-communist	-5.052** (1.901)	-8.451** (3.371)	5.087 (3.313)	8.771*** (2.660)
Union density	-0.038* (0.019)	-0.011 (0.019)	-0.055* (0.027)	-0.054* (0.031)
Period Effects	✓	✓	✓	✓
Observations	183	183	56	56
Number of countries	24	24	20	20
Number of instruments	49	48	37	40
Sargan test	0.435	0.953	0.251	0.099
A-B test 2nd-order corr	0.407	0.350	0.187	0.502

System GMM estimations with robust standard errors, small sample correction, and forward orthogonal deviations. Models (1) and (3) also include external instruments.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 4 Social Spending and Pre-Government Income Inequality**

Regarding the other covariates, model (3) gives weak support for the existence of an inverted U relationship of economic development and pre-government inequality. Yet, this finding vanishes when controlling for the targeting structure of benefits. Furthermore, there is

<sup>20</sup>This finding is also confirmed when using OLS as estimation method. However, the effect becomes insignificant and negative in the FE model (see Table 6 in the Appendix).



some evidence that a higher dependency rate is associated with more inequality in pre-government incomes. Also, post-socialist countries display significantly larger levels of pre-government income inequality. As expected from theory, stronger labor market institutions are negatively related to pre-government inequality.

## V. Conclusion

The purpose of this paper was to analyze whether more generous social spending policies are indeed associated with lower income inequality levels. Specifically, it examines to what extent negative behavioral effects might counteract the redistributive first-round effects of social benefits. According to the theoretical framework, the overall effect of social spending on post-government income inequality is a priori not clear, since social spending policies are expected to have a positive effect on pre-government income inequality. In addition, it is suggested that different benefit functions have different objectives and might, thus, be related to differing distributional outcomes

One major result of the regression analysis reveals that a larger social budget is strongly related with lower inequality levels in post-government incomes. This suggests that overall, redistributive first-round effects outweigh any inequality-increasing second-order effects. This negative effect of social spending on income inequality is robust to various specification choices. In particular, the effect remains statistically significant when severely reducing the instrument count and when using different data specifications, suggesting a *causal effect* of social spending levels on post-government income inequality. With respect to the inequality in pre-government incomes, I cannot identify any statistically significant effect of the overall spending generosity of welfare states. The empirical evidence suggests, however, that if there is an effect, it is positive. In terms of the different functions of social benefits, the results reveal that not all benefits are associated with lower inequality levels. More specifically, unemployment benefits and public

pensions seem to be responsible for the inequality reducing impact.

Regarding the targeting structure of social policies, the empirical results reveal that social protection systems that specifically target low income groups are not associated with lower inequality levels in post-government incomes. This finding hints at the importance of possible disincentive effects created by low income targeting that counteract equalizing first-round effects. Additional regressions show that a higher proportion of means-tested benefits is indeed associated with more inequality in pre-government incomes. This strengthens the argument that more low income targeting comes at the cost of substantial negative second-order effects.

Note, however, that there are limitations to my analysis. First, the analysis only discusses behavioral effects related to labor-market–related decisions. However, social spending policies also affect pre-government incomes in ways other than through labor market outcomes. Redistributive policies might also affect the behavior of market actors with regard to investment and saving decisions, geographical mobility, and so on. All these effects and their impact on inequality are not discussed. Second, the paper only analyzes the effect of overall benefit levels on income inequality. However, specific additional characteristics such as the duration of benefits and other eligibility criteria might be responsible for the effects on income inequality. Thus, to make more specific statements about the distributional and behavioral effects of social programs, more information on the characteristics of these programs is needed. This information is also important for specific policy recommendations.

## Appendix

Dependent Variable: Gini Coefficient Post-Government Income

VARIABLES	(1) EU-15	(2) EU-SILC	(3) structural break'	(4)
Lagged Gini Coefficient	0.411*** (0.108)	0.143 (0.141)	0.615*** (0.149)	0.408* (0.214)
Social Benefits	-0.227** (0.084)	-0.468** (0.180)	-0.200* (0.103)	-0.273** (0.103)
GDP pc (in 1000 int \$)	-0.255*** (0.061)	-0.250* (0.128)	-0.115 (0.075)	-0.126 (0.098)
GDP pc squared (in 1000 int \$)	0.002*** (0.001)	0.002 (0.001)	0.001 (0.001)	0.001 (0.001)
Dependency Rate	0.149 (0.089)	0.467* (0.240)	0.406** (0.161)	0.602*** (0.206)
Prop Secondary Education	-0.032 (0.027)	-0.047* (0.027)	-0.012 (0.026)	-0.028 (0.035)
Post-communist		-4.906*** (1.640)	-2.041 (1.831)	-3.256 (2.006)
Union density	-0.020 (0.014)	-0.049* (0.026)	-0.024 (0.024)	-0.039 (0.034)
Data			1.033*** (0.260)	5.828 (3.693)
Data * Social Benefits				-0.173 (0.130)
Period Effects	✓	✓		
Observations	161	75	183	183
Number of countries	15	24	24	24
Number of instruments	48	43	38	39
Sargan test	0.097	0.753	0.466	0.611
A-B test 2nd-order corr	0.549	0.060	0.286	0.304

System GMM estimations with robust standard errors, small sample correction, forward orthogonal deviations, and collapsed instruments. All equations also include external instruments.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 5 Data Robustness Checks**

Dependent Variable: Gini Coefficient Post-Government Income

VARIABLES	Coefficient		Std.Dev.	R <sup>2</sup>	Obs.
<u>Pooled OLS</u>					
Social Benefits	-0.159	***	0.043	0.908	183
Unemployment	-0.096	**	0.037	0.909	183
Family-related	-0.130	**	0.057	0.909	183
Invalidity	-0.062		0.042	0.908	183
Health-related	-0.067		0.049	0.908	183
Old-age and survivor	-0.039	**	0.017	0.909	183
Housing and exclusion	-0.050		0.061	0.908	183
Means-tested	-0.021		(0.033)	0.908	183

Dependent Variable: Gini Coefficient Pre-Government Income

Lagged Social Benefits	0.059		(0.048)	0.898	56
Lagged Means-tested	0.203	**	(0.090)	0.908	56

Fixed-Effects

Social Benefits	-0.214	**	0.108	0.336	183
Unemployment	-0.309	***	0.115	0.358	183
Family-related	-0.251	*	0.130	0.346	183
Invalidity	-0.268	*	0.147	0.346	183
Health-related	0.075		0.105	0.360	183
Old-age and survivor	0.101		0.088	0.348	183
Housing and exclusion	-0.235		0.220	0.339	183
Means-tested	-0.039		(0.107)	0.337	183

Dependent Variable: Gini Coefficient Pre-Government Income

Lagged Social Benefits	-0.052		(0.367)	0.536	56
Lagged Means-tested	-0.211		(0.416)	0.540	56

Full specifications include the same additional control variables as the previous estimations as well as period effects.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 6 OLS and FE Specifications**

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